DOCUMENT VET SHEET
for
Karen McConnaughay
Chairman, Kane County Board

Name of Document: Contract # 09-002

Submitted by: Tim Keovongsak / Purchasing Dept.

Date Submitted: 2/26/09

Examined by: KC, Jorno
(Print name)

(Signature)

3/14/09
(Date)

Comments:

Chairman signed: (Yes) **No** 3-25-09
(Date)

Document returned to: Tim K.

Rev. 8/05

County of Kane
PURCHASING DEPARTMENT
KANE COUNTY GOVERNMENT CENTER

CHRISTOPHER ROSSMAN
Director of Purchasing

719 S. Batavia Avenue, Bldg. A.
Geneva, Illinois 60134
Telephone: (630) 232-5929
Fax: (630) 208-5107

February 25, 2009

To: Ken Shepro

From: Chris Rossman

Re: Contract for Bid 09-002 Generator

This contract is for Bid 09-002 Generator that was approved by the County Board on February 10, 2008, as Resolution 09-30. Work for this project is scheduled to start March 4, 2009.

Attached: Contract 09-002

OFFER TO CONTRACT FORM
KANE COUNTY
BID 09-002 GENERATOR

The following offer is hereby made to the County of Kane, Illinois, hereafter called the Owner.

Submitted By: ROSS ELECTRIC, INC

1. The undersigned Bidder proposes and agrees, after having examined the specifications, quantities and other contract documents, to irrevocably offer to furnish the materials, equipment and services in compliance with all terms, conditions, specifications and amendments contained in the bid solicitation documents. The items in this Invitation to Bid, including, but not limited to, all required certificates, are fully incorporated herein as a material and necessary part of the contract.

   A. The Bidder shall also include with his bid any necessary literature, samples, etc., as required within the Invitation to Bid and specification.

   B. For purposes of this offer, the terms Offerer, Bidder, Contractor, and Vendor are used interchangeably.

2. In submitting this Offer, Bidder acknowledges:

   A. All bid documents have been examined: Instructions to Bidder, Special Conditions, Division 1, 26 and 31 of the Specifications and Drawings dated September 5, 2008,; the following addenda: No. 1, No. 2, No. 3, No._____. (Bidder to acknowledge addenda here.)

   B. The site and locality has been examined where the Work is to be performed, the legal requirements (federal, state and local laws, ordinances, rules and regulations) and the conditions affecting cost, progress or performance of the Work and has made such independent investigations, as Bidder deems necessary.

   C. Work will be accomplished in accordance with the Contract documents and complete the Work within the stated Contract time as outlined in the Special Provision to Bidders.

   D. To be prepared to execute a contract with the Owner within ten (10) calendar days after acceptance of the bid by the Owner, and furnish a Performance Bond and Labor Material Bond in accordance with the Instruction to Bidders.

3. The bidder will complete this project for the furnishing and installing the 450-kilowatt generator for total lump sum cost of:

   A. Total Bid Amount TWO HUNDRED TWELVE THOUSAND AND 00/100

   _____(Words)

   Dollars ($ 212,000.00)

4. The Contractor guarantees completion of all the work within 120 Days after receipt of notice of award or purchase order, and understands work must be 100% completed by May 10, 2009.

By signing this Bid, the Offeror hereby certifies that they are not barred from bidding on this contract as a result of a violation of either Section 33E-3 or 33E-4 of the Illinois Criminal Code of 1961, as amended. The awarding of any contract resulting from this Bid will be based upon the funding available to Kane County, which may award all or part of this project. The terms of the Bid and the response shall be incorporated by this reference as though fully set forth into the Contract not withstanding any language in the contract to the contrary. In the event of any conflict between the terms of the Contract and the terms of the Bid and the response, the terms of the Bid and the response shall govern. Every element or item of the Bid and the response shall be deemed a material and severable item or element of the contract. **THIS SECTION MUST BE SIGNED BY AN AUTHORIZED REPRESENTATIVE OF THE COMPANY OR ENTITY RESPONDING TO THE BID AND THE RESPONSE.**

Signature Paul Ross Typed Signature PAUL ROSS

Company ROSS ELECTRIC, INC

Address 25.342 HARTER RD KANEVILLE, IL 60144

Phone # 630-557-9015 Fax # 630-557-9017

Federal I.D./Social Security # 36-4063116 Date 1/2/08

ACCEPTANCE

The Offer is hereby accepted for the complete project.

The Vendor is bound to sell the materials and services listed by the attached contract and based upon the Invitation to Bid, including all terms, conditions, specification, amendments, and the Vendor's offer is accepted by the County of Kane.

This contract shall henceforth be referred to as Contract Number 09-002. The Vendor has been cautioned not to commence any billable work or to provide any materials or services until this Vendor receives a purchase order and or notice to proceed.

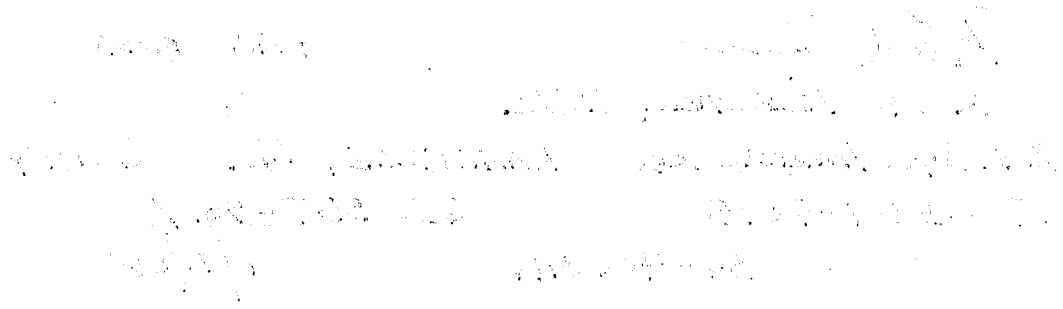
PLEAS

Karen McConnaughay Date

Karen McConnaughay
Chairman, County Board
Kane County, Illinois

John A. Cunningham Date

John A. Cunningham
Clerk, County Board
Kane County, Illinois



POWERTRON®
Generator Sales, Service & Rental — Division of Steiner Electric Company

Quote #: CG081222-14A
450kW Sound Housed Diesel Generator & (2) ATS: **KANE COUNTY GOVT CENTER / GENEVA**
December 30, 2008

INTERESTED BIDDER

Steiner Electric Co., sole distributor of Kohler generators in Northern IL, is pleased to quote the following equipment per plans & specifications by Cordogan, Clark & Associates; this quoted equipment is basis for design by engineer.

QTY	UL Listed, NFPA-110 system per Kohler Q# 25488553	Sub-Total Price
1	**Kohler 450REOZDD Outdoor Diesel Generator**, standby rated 1,561 Amps per phase at 208Y/120V 3ph-4w = 450 kW / 563 kVA at 0.8 lag pf, 1800rpm, 60Hz. Agency Approvals: UL 2200, NFPA-110, EPA Certified Tier-3. **Provided with these all-Kohler Co. installed items (no buyouts):** Steel, box-frame, skid base; isolation mounted to the following: 898gal UL Std. #142 (black) diesel tank with: 5gal spill-fill contain and leak alarm (>24hrs FL) Sound-housing, light crème beige, locking, enclosed critical silencer, UL flame-rated liner Sound level, level-2 (25dB reduction); 75dB average, free-field, FL, 23 ft. horizontal distance Enclosure interior 100A, Main C/B, 208V 3ph-4w panel-board, pre-wired to: battery charger, block heater, (3) switched AC interior lights, motorized inlet louvers, (2) 120V, 20A outlets Gravity operated radiator hot air output louvers 14L, DDC 6cyl Turbo-Diesel is Tier-3 certified and has air cleaner restriction indicator Fuel accessories: flexible fuel lines, fuel-water separator, (2) fuel filters, fuel primer pump Unit mounted radiator, high ambient Factory Phil engine crankcase lubricating oil and antifreeze coolant pre-mix Engine Driven, Battery Charging Alternator with Voltage Regulator 24vdc / 40A Alternator, PMG #5M4027, with up to 1550kVA peak Digital Isochronous Governor for +/-0.25% Steady-State Frequency Regulation Digital Voltage Regulator for +/-0.25% No-Load to Full-load Voltage Regulation Pre-Alarm senders to controller, NFPA-110 DEC-550, NFPA-110 all-digital controller with Electric & Engine Meters & Mod-Bus port Block Heater, 2500W, 208V 1ph, pre-wired to enclosure interior panel-board Battery Charger, NFPA-110, 24VDC/10A, pre-wired to enclosure interior panel-board Two (2) Output Circuit Breakers: (1) 1200-Amp and (1) 400-Amp Common Fault & Run Relays, 10-Relay Board and Low Fuel dry contact for owner monitoring Above Items ship built as one unit: 132"H x 93"W x 294"L; **9-tons** (excludes diesel fuel) **LOOSE ITEMS (Installed by others), SERVICES AND WARRANTY** (1) Asco 1200A 208V 3ph-4w 4-pole, switched neutral, open transition, in-phase monitor, Nema-1 ATS, #H-300-B3-1200-C1XC-11BG-14AA/14BA-72E: 87"H x 38"W x 24"D; 700 lbs (1) Asco 400A Service Entrance with integral 400A utility input C/B rated 35kAIC, 208V 3ph-4w 4-pole, switched neutral, Nema-3R, #E-3AUS-C3-400-C1XM-11BG-14AA/14BA-72E, 49"H x 36"W x 16"D; 550 lbs. (1) Kohler Monitor-III software and (2) user keys (2) MODBUS-Ethernet Converters, each require fused 24VDC from generator (1) RASP, NFPA-110, 16-light, (needs Belden #9841 cable, no sub & 24vdc from generator) (2) Remote Emergency Stop Switch (locate & label per inspector requirements) (1) Battery rack and cables (2) 12V Starting Batteries Provided & Installed by Powertron at startup Certified Factory Test Report at 0%, 25%, 50%, 75% and 100% load and 0.8 lag PF test Site Startup, Normal Hours, M-F 8am-4pm, Non-holidays, 14 Days Notice to schedule Full kW NFPA-110 load bank test at startup, includes load bank and cables Set, Owner's Manual, Install Manual and User's Manual for generator and ATS Freight cost included to site with open flatbed lowboy with **NO UNLOAD** (by others) **Five Year** parts & labor generator only system warranty from startup date per Kohler terms **Five Year** parts & labor ATS' only system warranty from factory ship date per ASCO terms First Two Years PM agreement with quarterly inspections & (2) changes oil & filters changed Spares kit with set filters: oil, fuel, air and set: controller lamps & fuses & charger fuses Basic user training visit scheduled by owner M-F 8am-4pm, non-holidays, 7 days notice Software user training visit scheduled by owner M-F 8am-4pm, non-holidays, 7 days notice **REQUIRED OPTIONAL HARDWARE: Special CAT-5 cable (no sub allowed)** Belden #9841 cable, no sub, no splice, between RASP and generator.....**$ 1.00 per foot** **OPTION THAT MAY BE REQUIRED BY STATE FIRE MARSHALL (if needed)** Site pressure test of diesel tank, State Fire Marshall may want to witness this.....$ 1,250.00	

Steiner Electric Company
1275 Touhy Avenue • Elk Grove Village, Illinois 60007 • Phone: 847.956.3098 • Fax: 847.956.5013

KOHLER. Industrial Power

Diesel Generators / 450REOZDD

Return to Results

Features

- Kohler Co. provides one-source responsibility for the generating system and accessories.
- The generator set and its components are prototype-tested, factory-built, and production-tested.
- The 60 Hz generator set offers a UL 2200 listing.
- The generator set complies with ISO 8528-5, Class G3, requirements for transient performance.
- The generator set accepts rated load in one step.
- The 60 Hz generator set meets NFPA 110, Level 1, when equipped with the necessary accessories and installed per NFPA standards.
- The 60 Hz generator set engine is certified by the Environmental Protection Agency (EPA) to conform to Tier 3 nonroad emissions regulations.
- A one-year limited warranty covers all systems and components. Two-, five-, and ten-year extended warranties are also available.

Alternator features:

- The pilot-excited, permanent-magnet (PM) alternator provides superior short-circuit capability.
- The brushless, rotating-field alternator has broad range reconnectability.
- NEMA MG1 ,IEEE, and ANSI standards compliance for temperature rise and motor starting.
- Sustained short-circuit current of up to 300% of the rated current for up to 10 seconds.
- Sustained short-circuit current enabling down stream circuit breakers to trip without collapsing the alternator field.
- Self-ventilated and dripproof construction.
- Superior voltage waveform from a two-thirds pitch stator and skewed rotor.
- Digital solid-state, volts-per-hertz voltage regulator with ±0.25% no-load to full-load regulation.
- Brushless alternator with brushless pilot exciter for excellent

load response.

Other features:

- Controllers are available for all applications.
- The low coolant level shutdown prevents overheating (standard on radiator models only).
- Integral vibration isolation eliminates the need for under-unit vibration spring isolators.
- An electronic, isochronous governor delivers precise frequency regulation.
- Electronic engine controls manage the engine.

Specifications

Prime Ratings:	410 kW (513 kVa)
Standby Ratings:	450 kW (563 kVa)
Hertz:	60 Hz
Alternator Type:	Brushless, Permanent-Magnet, Pilot Exciter
EPA Tier Level:	3
Engine Manufacturer:	Detroit Diesel
Engine Model:	Series 60
Cylinder Arrangement:	6 Inline
Max Power at Rated RPM:	511 kWm (685 BHP)
Prime Fuel Consumption at	
100% load:	122.6 Lph (32.4 gph)
75% load:	92 Lph (24.3 gph)
50% load:	62.1 Lph (16.4 gph)
25% load:	33.3 Lph (8.8 gph)
Standby Fuel Consumption at	
100% load:	131 Lph (34.6 gph)
75% load:	100.3 Lph (26.5 gph)
50% load:	68.9 Lph (18.2 gph)
25% load:	36.3 Lph (9.6 gph)

Options

Generator Controls

Decision-Maker 3+
Decision-Maker 550

WEST BEND
A MUTUAL INSURANCE COMPANY™

Bond Number 0935102

Labor and Material Payment Bond

KNOW ALL MEN BY THESE PRESENTS:

That Ross Electric Inc of 2S342 Harter Road, Kaneville IL 60144
(Name and address of the Contractor)

as Principal, hereinafter called Principal, and WEST BEND MUTUAL INSURANCE COMPANY as Surety, hereinafter called Surety, are held and firmly bound unto

Kane County, 719 S Batavia Ave, Geneva IL 60134
(Name and address of the Owner)

as Obligee, hereinafter called Owner, for the use and benefit of claimants as hereinbelow defined, in the amount of

Two Hundred Twelve Thousand, Dollars and Zero Cents Dollars ($ 212,000.00),
(Insert a sum equal to at least one-half of the contract price)

for the payment whereof Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, Principal has by written agreement dated 02/10/2009 entered into a contract with Owner for the purchase and installation of 450 kilowatts generator for Building C and E at 719 S Batavia Ave, Geneva IL 60134

in accordance with drawings and specifications prepared by

(Full name and address of Architect/Engineer)

which contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that if the Principal shall promptly make payment to all claimants as hereinafter defined, for all labor and material used or reasonably required for use in the performance of the Contract, then this obligation shall be void; otherwise it shall remain in full force and effect, subject, however, to the conditions outlined on the reverse side of this bond:

Signed and Sealed this 16th day of February 20 09

Principal:
Ross Electric Inc

Witness: Cath Kovach

By: Paul Ross (SEAL)

Name Typed: Paul Ross, Owner

Title

Surety:
West Bend Mutual Insurance Company

Witness: Christine Flanigan

By: Melissa Padilla (SEAL)

Name Typed: Melissa Padilla, Attorney in fact

Title

MICHIGAN ONLY: This policy is exempt from the filing requirements of Section 2236 of the Insurance Code of 1956, 1956 PA 218 and MCL 500.2236.

8401 Greenway Blvd. Suite 1100 | Middleton, WI 53562 | Phone: (608) 410-3410 | Fax: (877) 674-2663 | www.wbmi.com

CONDITIONS

1. A claimant is defined as one having a direct contract with the Principal or with a Subcontractor of the Principal for labor, material, or both, used or reasonably required for use in the performance of the Contract, labor and material being construed to include that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental of equipment directly applicable to the Contract.
2. The above named Principal and Surety hereby jointly and severally agree with the Owner that every claimant as herein defined, who has not been paid in full before the expiration of a period of ninety (90) days after the date on which the last of such claimant's work or labor was done or performed, materials were furnished by such claimant may sue on this bond for the use of such claimant, prosecute the suit to final judgement for such sum or sums as may be justly due claimant, and have execution thereon. The Owner shall not be liable for the payment of any costs or expenses of any such suit.
3. No suit or action shall be commenced hereunder by any claimant.
   a. Unless claimant, other than one having a direct contract with the Principal, shall have given written notice to any two of the following: The Principal, the Owner, or the Surety above named, within ninety (90) days after such claimant did or performed the last of the work or labor, or furnished the last of the materials for which said claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were furnished, or for whom the work or labor was done or performed. Such notice shall be served by mailing the same by registered mail or certified mail, postage prepaid, in an envelope addressed to the Principal, Owner or Surety, at any place where an office is regularly maintained for the transaction of business, or served in any manner in which legal process may be served in the state in which the aforesaid project is located, save that such service need not be made by a public officer.
   b. After the expiration of one (1) year following the date on which Principal released work on said Contract, it being understood, however, that if any limitation embodied in this bond is prohibited by any law controlling the construction hereof such limitation shall be deemed to be amended so as to be equal to the minimum period of limitation permitted by such law.
   c. Other than in a state court of competent jurisdiction in and for the county or other political subdivision of the state in which the project, or any part thereof, is situated, or in the Untied States District Court for the district in which the project, or any part thereof, is situated, and not elsewhere.
4. The amount of this bond shall be reduced by and to the extent of any payment or payments made in good faith hereunder, inclusive of the payment by Surety of mechanics' liens which may be filed of record against said improvement, whether or not claim for the amount of such lien be presented under and against this bond.

8401 Greenway Blvd. Suite 1100 | Middleton, WI 53562 | Phone: (608) 410-3410 | Fax: (877) 674-2663 | www.wbmi.com

WEST BEND
A MUTUAL INSURANCE COMPANY™

Bond Number 0935102

Performance Bond

KNOW ALL MEN BY THESE PRESENTS:

That Ross Electric Inc of 2S342 Harter Road, Kaneville IL 60144
(Name and address of the Contractor)

as Principal, hereinafter called Principal, and WEST BEND MUTUAL INSURANCE COMPANY as Surety, hereinafter called Surety, are held and firmly bound unto Kane County, 719 S Batavia Ave, Geneva IL 60134
(Name and address of the Owner)

as Obligee, hereinafter called Owner, in the amount of
Two Hundred Twelve Thousand, Dollars and Zero Cents Dollars ($ 212,000.00),

for the payment whereof Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, Contractor has by written agreement dated 02/10/2009 entered into a contract with Owner for purchase & installation of 450 kilowatts generator for Building C & E at 719 S Batavia Ave, Geneva IL 60134 in accordance with drawings and specifications prepared by

(Full name and address of Architect or Engineer)

which contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if Contractor shall promptly and faithfully perform said contract, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

The Surety hereby waives notice of any alteration or extension of time made by the Owner.

Whenever Contractor shall be, and declared by Owner to be in default under the Contract, the Owner having performed Owner's Obligations thereunder, the Surety may promptly remedy the default, or shall promptly

1. Complete the Contract in accordance with its terms and conditions, or
2. Obtain a bid or bids for completing the Contract in accordance with its terms and conditions, and upon determination by Surety of the lowest responsible bidder, or, if the Owner elects, upon determination by the Owner and the Surety jointly of the lowest responsible bidder, arrange for a contract between such bidder and Owner, and make available as Work progresses (even though there should be a default or a succession of defaults under the contract or contract of completion arranged under this paragraph) sufficient funds to pay the cost of completion less the balance of the contract price; but not exceeding, including other costs and damages for which the surety may be liable hereunder, the amount set forth in the first paragraph hereof. The term "balance of the contract price", as used in this paragraph, shall mean the total amount payable by Owner to Contractor under the Contract and any amendments thereto, less the amount properly paid by Owner to Contractor.

Any suit under this bond must be instituted before the expiration of one (1) year from the date on which final payment under the contract falls due.

No right of action shall accrue on this bond to or for the use of any person or corporation other than the Owner named herein of the heirs, executors, administrators or successors of the Owner.

Signed and Sealed this 16th day of February 20 09

Principal:
Ross Electric Inc

Witness: Cathi Kovach

By: Paul Ross (SEAL)

Name Typed: Paul Ross , Owner
Title

Surety:
West Bend Mutual Insurance Company

Witness: Christine D. Flanigan

By: (SEAL)

Name Typed: Melissa Padilla , Attorney in fact
Title

MICHIGAN ONLY: This policy is exempt from the filing requirements of Section 2236 of the Insurance Code of 1956, 1956 PA 218 and MCL 500.2236.

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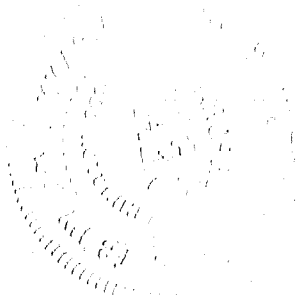

INSTRUCTIONS TO BIDDERS

COUNTY OF KANE
COMPETITIVE SELECTION PROCEDURE - BID
TERMS AND CONDITIONS

1. **AUTHORITY.** This Invitation for Bid is issued pursuant to applicable provisions of the Kane County Purchasing Ordinance.

2. **BID OPENING**. Sealed bids will be received at the Kane County Purchasing Department until the date and time specified at which time they shall be opened in public. Late bids shall be rejected and returned unopened to the sender. Kane County does not prescribe the method by which bids are to be transmitted; therefore, it cannot be held responsible for any delay, regardless of the reason, in transmission of the bids.

3. **BID PREPARATION**. Bids must be submitted on this form and all information and certifications called for must be furnished. Bids submitted in any other manner, or which fail to furnish all information or certificates required, may be summarily rejected. Bids may be modified or withdrawn prior to the time specified for the opening of bids. Bids shall be filled out legibly in ink or type-written with all erasures, strike overs and corrections initialed in ink by the person signing the bid. The bid shall include the legal name of the bidder, the complete mailing address, and be signed in ink by a person or persons legally authorized to bind the bidder to a contract. Name of person signing should be typed or printed below the signature.

4. **BID ENVELOPES**. Envelopes containing bids must be sealed and addressed to the County of Kane Purchasing Department. The name and address of the bidder and the Invitation Number must be shown in the upper left corner of the envelope.

5. **ERRORS IN BIDS**. Bidders are cautioned to verify their bids before submission. Negligence on the part of the bidder in preparing the bid confers no right for withdrawal or modification of the bid after it has been opened. In case or error in the extension of prices in the bid, the unit prices will govern.

6. **RESERVED RIGHTS**. The County of Kane reserves the right at any time and for any reason to cancel this Invitation for Bids, accept or reject any or all bids or any portion thereof, or accept an alternate bid. The County reserves the right to waive any immaterial defect in any bid. Unless otherwise specified by the bidder or the County, the County has ninety (90) days to accept as stated on page 14 under Bid Acceptance Period. The County may seek clarification from any bidder at any time and failure to respond promptly is cause for rejection.

7. **INCURRED COSTS**. The County will not be liable for any costs incurred by bidders in replying to this Invitation for Bids.

8. **AWARD**. It is the intent of the County to award a contract to the lowest responsive responsible bidder meeting specifications. The County reserves the right to determine the lowest responsive responsible bidder on the basis of an individual item, groups of items, or in any way determined to be in the best interests of the County. Award will be based on the following factors (where applicable): (a) adherence to all conditions and requirements of the bid specifications; (b) price; (c) qualifications of the bidder, including past performance, financial responsibility, general reputation, experience, service capabilities, and facilities; (d) delivery or completion date; (e) product appearance, workmanship, finish, taste, feel, overall quality, and results of product testing; (f) maintenance costs and warranty provisions; and (g) repurchase or residual value.

9. **PRICING**. The price quoted for each item is the full purchase price, including delivery to destination, and includes all transportation and handling charges, premiums on bonds, material or service costs, patent royalties and all other overhead charges of every kind and nature. Unless otherwise specified, prices shall remain firm for the contract period.

10. **DISCOUNTS**. Prices quoted must be net after deducting all trade and quantity discounts. Where cash discounts for prompt payment are offered, the discount period shall begin with the date of receipt of a correct invoice or receipt or final acceptance of goods, whichever is later.

11. **TAXES**. Kane County is not subject to Federal Excise Tax. Per Illinois Revised Statutes, Chapter 120, Paragraph 441: Kane County is exempt from state and local taxes.

12. **SPECIFICATIONS**. Reference to brand names and numbers is descriptive, but not restrictive, unless otherwise specified. Bids on equivalent items will be considered, provided the bidder clearly states exactly what is proposed to be furnished, including complete specifications. Unless the bidder specified otherwise, it is understood the bidder is offering a referenced brand item as specified or is bidding as specified when no brand is referenced, and does not propose to furnish an "equal." The County reserves the right to determine whether a substitute offer is equivalent to and meets the standard of quality indicated by the brand name and number referenced.

13. **SAMPLES**. Samples of items, when called for, must be furnished free of expense and, if not destroyed in the evaluation process, will, upon request, be returned at the bidder's expense. Request for the return of samples must accompany the sample and include UPS Pickup Slip, postage or other acceptable mode of return. Individual samples must be labeled with bidder's name, invitation number, item reference, manufacturer's brand name and number.

14. **INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS**. Bidders shall promptly notify the County of any ambiguity, inconsistency of error which they may discover upon examination of the bidding documents. Interpretations, corrections and changes will be made by addendum. Each bidder shall ascertain prior to submitting a bid that all addenda have been received and acknowledged in the bid.

15. **VARIANCES**. State or list by reference on the reverse side of this form any variations to specifications, terms and/or conditions.

16. **INDEMNIFICATION**. The Seller shall indemnify and hold harmless the County, its agents, officials, and employees, from and against all injuries, losses, claims, suits, costs and expenses which may accrue against the County as a consequence of granting the Contract.

    Contractor and/or Servicer's and/or Seller (as case may be), agrees to save, hold harmless, defend and indemnify the County of Kane and its Officers, Agents, and Employees, from any and all liability or loss incurred by the County of Kane resulting from Contractor's and/or Servicer's and/or Seller's noncompliance with any laws or regulations of any governmental authority having jurisdiction over Contractor's and/or Servicer's and /or Seller's performance of this contract and Contractor's and/or Seller's violation of any of the terms and conditions of this Agreement, and from the Contractor's and/or Servicer's and/or Seller's negligence arising from, in any manner and in any way connected with, the terms and conditions of this Agreement and arising from the Contractor's and/or Servicer's and/or Seller's performance thereunder.

17. **DEFAULT**. Time is of the essence of this contract and if delivery of acceptable items or rendering of services is not completed by the time promised, the County reserves the right, without liability, in addition to its other rights and remedies, to terminate the contract by notice effective when received by Seller, as to stated items not yet shipped or services not yet rendered and to purchase substitute items or services elsewhere and charge the Seller with any or all losses incurred.

18. **INSPECTION**. Materials or equipment purchased are subject to inspection and approval at the County's destination. The County reserves the right to reject and refuse acceptance of items which are not in accordance with the instructions, specifications, drawings or data of Seller's warranty (express or implied). Rejected materials or equipment shall be removed by, or at the expense of, the Seller promptly after rejection.

19. **WARRANTY**. Seller warrants that all goods and services furnished hereunder will conform in all respects to the terms of the solicitation, including any drawings, specifications or standards incorporated herein, and that they will be free from latent and patent defects in materials, workmanship and title, and will be free from such defects in design. In addition, Seller warrants that said goods and services are suitable for, and will perform in accordance with, the purposes for which they are purchased, fabricated, manufactured and designed or for such other purposes as are expressly specified in this solicitation. The County may return any nonconforming or defective items to the Seller or require correction or replacement of the item at the time the defect is discovered, all at the Seller's risk and expense. Acceptance shall not relieve the Seller of its responsibility.

Contractor and/or Seller (as case may be) expressly warrants that all goods and services (real property and all structures thereon) will conform to the drawings, materials, performance and any other specifications, samples or other description furnished by the County, and will be fit and sufficient for the purpose intended, merchantable, of good material and workmanship. Contractor and/or Seller (as case may be) agrees that these warranties shall run to Kane County, its successor, assigns, customers and users of the products or services and that these warranties shall survive acceptance of the goods or performance of the services.

20. **REGULATORY COMPLIANCE**. Seller represents and warrants that the goods or services furnished hereunder (including all labels, packages and container for said good) comply with all applicable standards, rules and regulations in effect under the requirements of all Federal, State and local laws, rules and regulations as applicable, including the Occupational Safety and Health Act as amended, with respect to design, construction, manufacture or use for their intended purpose of said goods or services. Seller shall furnish "Material Safety Data Sheet" in compliance with the Illinois Toxic Substances Disclosure to Employees Act.

21. **EQUAL EMPLOYMENT OPPORTUNITY**. (Res.No. 82-90, 6-10-80; Res. No. 81-79, 6-9-81: Res. No. 82-90, 6-8-82; 05-303, 09-23-05) State law references--Fair Employment Practices Act, Ill. Rev.Stat. Ch. 48, Sec.851 et seq.; requirements for public contracts, Ill. Rev. Stat. Ch. 48, Sec. 854.

22. **PREVAILING WAGE RATES**

WHEREAS, it is the policy of the State of Illinois as declared in "An ACT regulating wages of laborers, mechanics and other workman employed in any public works by the State, County, City or any political subdivision or by any work under construction for public works" approved June 26, 1941, that a wage of no less that the general prevailing hurly rate as paid for work of a similar character in a locality in which work is performed, shall be paid to all laborers, workmen and mechanics employed by and on behalf of any and all public body engaged in public works, exclusive of maintenance work.

PREVAILING WAGE ACT AMENDMENT: HB-1855 (PA 095-0635) amends the Prevailing Wage Act and requires Public Works contractors, before work commences, to file with the Public Body, certification that they have a substance abuse program and provide drug testing. This Act applies to a contract to perform work on a public works project for which bids are opened on or after January 1, 2008, or if bids are not solicited for the contract to perform such work entered into on or after January 1, 2008. The provisions of this Act apply only to the extent there is no collective bargaining agreement in effect dealing with the subject matter of this Act.

Responsive Bidders must include with their bid a separate sheet showing trades to be employed and wage rates to be paid.

The current Illinois Department of Labor Prevailing Wage Rates for the County of Kane are available at their website http://www.state.il.us/agency/idol/. Prevailing wage rates are subject to revision monthly. Copies of the current prevailing wage rages are also available at the Kane County Purchasing Department, 719 Batavia Avenue, Geneva, Illinois.

Any contact within the purview of this resolution or of the Illinois Prevailing Wage Act shall provide that any contractor will employ apprentices who are properly indentured into a **Joint Apprenticeship Training Program** which is registered and certified with the United States Department of Labor, Bureau of Apprenticeship and Training. Failure to comply with the request for information or documentation will be construed as a material breach of the contract enabling the County to terminate the contract, seek forfeiture of any performance bond, and proceed with any other remedy against the contractor at law or inequity.

23. **ROYALTIES AND PATENTS**. Seller shall pay all royalties and license fees. Seller shall defend all suits or claims for infringement of any patent or trademark rights and shall hold the County harmless from loss on account thereof.

24. **LAW GOVERNING**. This contract shall be governed by and construed according to the laws of the State of Illinois.

25. **ELIGIBILITY**. By signing this bid, the bidder hereby certifies that they are not barred from bidding on this contract as a result of a violation of Article 33E, Public Contracts of the Illinois Criminal Code of 1961, as amended (Illinois Compiled Statutes, 720 ILCS 5/33E-1).

26. **CERTIFICATE OF INSURANCE REQUIRED BY KANE COUNTY**
Contractor to furnish and deliver prior to commencement of work, a completed Certificate of Insurance satisfactory to the requirements of County of Kane containing:

a) The Contractor and all subcontractors shall provide a Certificate of Insurance naming the Owner (Kane County) as certificate holders and as additional insured. The certificate shall contain a 30-day notification provision to the owner (Kane County) prior to cancellation or modification of the policy.

b) Commercial General Liability insurance including Products/ Completed Operations, Owners and Contractors Protective Liability and Broad Form Contractual Liability with the exclusion pertaining to explosion, collapse and underground Property Damage hazards eliminated. The limit of liability shall not be less than the following:

General Aggregate	$2,000,000
Products and Completed Operations	$2,000,000
Personal and Advertising Injury	$1,000,000
Each Occurrence	$1,000,000
or - Combined Single Limit	$1,000,000

c) Business Automotive Liability Insurance including owned, hired and non-owned automobiles with limits of not less than the following:

Each Person for Bodily Injury	$1,000,000
Each Occurrence for Bodily Injury	$1,000,000
Each Occurrence for Property Damage	$1,000,000
or - Combined Single Limit	$1,000,000

d) Statutory Worker's Compensation Insurance, including occupational disease with Employer's Liability limit not less than the following:

Employers Liability:	
Each Accident	$1,000,000
Disease - Policy Limit	$1,000,000
Disease Each Employee	$1,000,000

e) Umbrella Liability

Excess Limits	$2,000,000

Contractor to furnish a copy of the Endorsement showing Kane County, as an additional named insured on the General Liability policy; or provide separate coverage, in the amounts enumerated above, with an Owner's Protective policy.

The Contractor shall cease operations on the project if the insurance is cancelled or reduced below the required amount of coverage.

27. **EQUAL EMPLOYMENT OPPORTUNITY**

The equal employment opportunity clause required by the Illinois Fair Employment Practices Commission is hereby incorporated by reference in all contract made by the county of and in all bid specifications therefore furnished by the county to all bidders, contractors and subcontractors.

The County of Kane, State of Illinois, represents that it and the employing agencies responsible to it, conform to the following:

We do not discriminate against any employee or applicant for employment because of race, creed, color, age, disability, religion, sex, national origin/ancestry, sexual orientation, marital status, veteran status, political affiliation, or any other legally protected status. We will take whatever action is necessary to ensure that applicants and employees are treated appropriately regarding all terms and conditions of employment. We will post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of this nondiscrimination clause.

We will, in all solicitations or advertisements for employees placed by or on behalf of the employing agencies, state that all qualified applicants will receive consideration for employment without regard to race, creed, age, disability, religion, sex, national origin/ancestry, sexual orientation, marital status, veteran status, political affiliation, or any other legally protected status. (Res.No. 82-90, 6-10-80; Res. No. 81-79, 6-9-81: Res. No. 82-90, 6-8-82; 05-303, 09-23-05) State law references--Fair Employment Practices Act, Ill. Rev.Stat. Ch. 48, Sec.851 et seq.; requirements for public contracts, Ill. Rev. Stat. Ch. 48, Sec. 854.

28. **BID DEPOSIT**

All bids must be accompanied by a Bank Cashier's Check, Bank Draft, Certified Check, or Bid Bond for not less than five (5%) percent of the amount of the Bid, or according to the schedule as provided.

Accompanying this Bid is a Bank Cashier's Check, Bank Draft, Certified Check, or Bid Bond, complying with the requirements of the specifications, made payable to the **KANE COUNTY TREASURER.**

In the event that one check, draft or bond is intended to cover two or more bids, the amount must be equal to the sum of the bid guarantees of the individual sections covered.

29. **EXECUTION OF A PERFORMANCE BOND AND LABOR AND MATERIALS BOND**
When noted in the specifications, the County reserves the right to require the successful bidder to supply a Performance Bond and a Labor and Materials Bond within ten (10) calendar days of acceptance of the Vendor's bid by the County. The bonds, unless otherwise specified by the Director of Purchasing, shall be 100% of the total contract price.

30. **FAILURE TO FURNISH BOND**

In the event that the Vendor fails to furnish the abovementioned bonds within ten (10) calendar days after acceptance of the bid by the County, then the bid deposit of the bidder shall be retained by the County as liquidated damages, it being now agreed that said sum is a fair estimate of the amount of damages that said County will sustain due to the Bidder's failure to furnish said bonds.

SPECIAL CONDITIONS
Bid 09-002 Generator

1. PERMITS: The County will, prior to the start of any work, obtain necessary State, County and City permits, as required to perform the work outlined under this contract. It shall be the Contractor's responsibility to conduct the operations in such a manner so as to comply with all provisions and conditions of the permits.

2. DOWNTIME: The Contractor shall limit power outages to the County's building(s) during non-business hours only. Current business hours are Monday – Friday 8:30 a.m. to 4:30 p.m. Also all outages shall be coordinated with the County's Representative with at least a twenty-four (24) hour notice.

3. SITE PARKING: The Contractor's employees shall park in the lower parking lot east of the project site.

4. SITE STORAGE AREAS: The County will provide approximately six (6) parking spaces as a storage area for the Contactor behind building E, on the south side only.

5. CLOSING OF ROADWAY AND PARKING LOT: The Contractor shall not close off any area unless he has all equipment and materials on hand so as to expedite his operations and having any closer for a minimum amount of time.

   The Contractor will provide a twenty-four (24) hour notice, to the appropriate County Representative, prior to closing off any area on County property.

6. BARRICADES AND FENCING: The Contractor shall use the appropriate devices to protect the safety of County employees and the public that will be entering and leaving the County buildings and using parking areas near the project site.

7. EQUIPMENT DATA SHEETS: The Contractor shall provide dimensional drawings and specification sheets of the generator they are including with their bid, so that it is of an appropriate size to fit in the location it is to be placed.

   Should the Contractor desire to use material or equipment other than what specified, he shall clearly indicate in his bid on the Offer to Contract form. Full particulars on alternate equipment shall be submitted with the bid.

7. CLEAN UP: The clean up shall consist of removing all debris from under the jobsite, to include removal of all excess dirt, pipe pieces, lumber scraps, paper cups, etc., left by the Contractor's crews. Roadways, bike paths and sidewalks shall be swept daily or frequently if necessary. Clean up shall be perform as the work progresses, and a final clean up shall be done after all operations are completed.

SPECIFICATIONS
FOR

NEW GENERATOR FOR BUILDINGS 'C' AND 'E'

FOR
Kane County Government Center
179 S. Batavia Ave.,
Geneva, IL 60134

Specification Divisions 1 through 31

DATED: December 8 2008

PREPARED BY:
CORDOGAN, CLARK & ASSOCIATES
960 RIDGEWAY AVENUE, AURORA, ILLINOIS 60506

TABLE OF CONTENTS

SECTION 015000 - TEMPORARY CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Sections:

1. Division 26 for work restrictions and limitations on utility interruptions.

1.2 QUALITY ASSURANCE

A. Provide OSHA approved temporary barricades and barriers for the safety and protection of workers and passers-by.

PART 2 - PRODUCTS

2.1 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

B. Temporary Erosion and Sedimentation Control: Comply with requirements of 2003 EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

C. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways.

1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant- protection zones.
2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from the project site during the course of the project.
4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

E. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

F. Site Protection: Prior to commencing earthwork, furnish and install approved fencing, barricades, or barriers in a manner that will prevent people and animals from easily entering site except by designated entrances.

1. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction that prevent unauthorized entrance, vandalism, theft, and similar violations that create hazards for owner's staff and the general public. Lock entrances at end of each work day.
2. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
3. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.
4. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

2.2 OPERATION, TERMINATION, AND REMOVAL

A. Termination and Removal: Remove each temporary protection when need for its service has ended no later than Substantial Completion. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor.
2. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace landscaping, street paving, curbs, and sidewalks damaged by or during the work.

END OF SECTION 015000

SECTION 017300 - EXECUTION

PART 3 - GENERAL

3.1 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Progress cleaning.
6. Starting and adjusting.
7. Protection of installed construction.
8. Correction of the Work.

3.2 QUALITY ASSURANCE

A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

a. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.

b. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.

2. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

3.3 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 4 - PRODUCTS

4.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to the Owner for the visual and functional performance of in-place materials.

PART 5 - EXECUTION

5.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
2. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
3. Examine walls, floors, and ceilings for suitable conditions where products and systems are to be installed.
4. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

5.2 PREPARATION

A. Existing Utility Information: Verify utility information as specified elsewhere that is necessary to purchase equipment and route new underground feeders. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of the Contractor, submit a request for information to Owner according to specified requirements.

5.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings. If discrepancies are discovered, notify Owner promptly.

5.4 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring, unless otherwise indicated.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

G. Attachment: Provide anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Owner.

H. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

5.5 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut or core in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Do not make cuts that require new supports or shoring.

C. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

D. Adjacent Occupied Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

E. Existing Utility Services and Mechanical/Electrical Systems: See Division 26.

F. Cutting: Cut in-place construction by coring, drilling, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction.

1. In general, use hand digging to protect landscaping.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a coring machine with abrasive or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
5. Proceed with patching after construction operations requiring cutting are complete.

G. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
3. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

H. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

5.6 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

5.7 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: Comply with Division 26 requirements.

5.8 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

5.9 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their original condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

END OF SECTION 017300

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 6 - GENERAL

6.1 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory.
2. Emergency manuals.
3. Operation manuals for systems, subsystems, and equipment.
4. Product maintenance manuals.
5. Systems and equipment maintenance manuals.

B. Related Sections:

1. Divisions 26 Sections for Engine Generator and Automatic Transfer Switches..

6.2 CLOSEOUT SUBMITTALS

A. Format: Submit operations and maintenance manuals in the following format:

1. PDF electronic file. Assemble each manual into a composite electronically-indexed file. Submit on digital media acceptable to Architect.

2. Three paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves.

B. Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training.

PART 7 - PRODUCTS

7.1 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.

5. Name and contact information for Contractor.
6. Name and contact information for Owner.
7. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
8. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
2. File Names and Bookmarks: Enable bookmarking of individual documents based upon file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel upon opening file.

F. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.

1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf or post-type binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

    a. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
4. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

    a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
    b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

7.2 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
1. Power failure.
2. System, subsystem, or equipment failure.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

7.3 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Operating standards.
3. Operating procedures.
4. Operating logs.
5. Wiring diagrams.
6. Control diagrams.
7. Precautions against improper use.
8. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

7.4 PRODUCT MAINTENANCE MANUALS

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and lists of circumstances and conditions that would affect validity of warranties.

7.5 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins.
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

B. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training video recording, if available.

C. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

D. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

E. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

PART 8 - EXECUTION

8.1 MANUAL PREPARATION

A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

B. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

C. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

D. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

E. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1. Do not use original project record documents as part of operation and maintenance manuals.

F. Comply with Owner's close-out procedures for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823

SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL

PART 9 - GENERAL

9.1 RELATED DOCUMENTS

A. Drawings and general provisions of Division 26 Specification Sections apply to this Section.

9.2 SUMMARY

A. Section Includes:

1. Electrical equipment coordination and installation.
2. Sleeve seals.
3. Grout.
4. Common electrical installation requirements.

9.3 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. NBR: Acrylonitrile-butadiene rubber.

9.4 SUBMITTALS

A. Product Data: For sleeve seals.

9.5 COORDINATION

A. Coordinate arrangement, mounting, and support of electrical equipment:

1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
3. So connecting raceways and cables will be clear of obstructions and of the working and access space of other equipment.

B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

C. Coordinate sleeve and seal selection and application of firestopping where required.

PART 10 - PRODUCTS

10.1 SLEEVES FOR RACEWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

10.2 SLEEVE SEALS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable (unless noted otherwise).
2. Pressure Plates: Plastic. Include two for each sealing element.
3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

10.3 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 11 - EXECUTION

11.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

A. Comply with NECA 1.

B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items (unless noted otherwise).

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity. Where surface mounted devices on equipment doors conflict with adjoining equipment preventing the door from opening at least 90 degrees, relocate that device to a suitable non-conflicting wall space.

11.2 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Electrical penetrations occur when raceways and cables penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Fire-Rated Assemblies: Install UL listed sleeves/seals for penetrations of fire-rated floor and wall assemblies.

D. Cut sleeves to length for mounting flush with both surfaces of walls.

E. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable, unless indicated otherwise.

F. Seal space outside of sleeves with grout for penetrations of concrete and masonry

1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

G. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable with acoustical sealant.

H. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install listed sleeves and seals.

I. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves (except for cored openings in concrete) and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

J. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves except for cored openings in concrete). Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

11.3 SLEEVE-SEAL INSTALLATION

A. Install to seal exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

11.4 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly.

END OF SECTION 260500

SECTION 260523 - CONTROL-VOLTAGE ELECTRICAL POWER CABLES

PART 12 - GENERAL

12.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

12.2 SUMMARY

A. Section Includes:

1. UTP cabling.
2. RS-232 cabling.
3. RS-485 cabling.
4. Low-voltage control cabling.
5. Control-circuit conductors.
6. Identification products.

12.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. IDC: Insulation displacement connector.

C. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control and signaling power-limited circuits.

D. Open Cabling: Passing telecommunications cabling through open space (e.g., between the studs of a wall cavity).

E. RCDD: Registered Communications Distribution Designer.

F. UTP: Unshielded twisted pair.

12.4 SUBMITTALS

A. Product Data: For each type of product indicated.

12.5 QUALITY ASSURANCE

A. Qualifications: Equipment manufacturer's authorized representative.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, specified by manufacturer, and marked for intended location and application.

12.6 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.
   1. Test each pair of UTP cable for open and short circuits.

PART 13 - PRODUCTS

13.1 PATHWAYS

A. Support of Open Cabling: NRTL labeled for support of Category 5e cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.

   1. Support brackets with cable tie slots for fastening cable ties to brackets.
   2. Lacing bars, spools, J-hooks, and D-rings.
   3. Straps and other devices.

B. Conduit and Boxes: Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems."

   1. Outlet boxes, where applicable, shall be as specified by the manufacturer.

13.2 UTP CABLE

A. Description: Match existing owner's standard: 100-ohm, four-pair UTP covered with a thermoplastic jacket with industry standard color.

   1. Comply with ICEA S-90-661 for mechanical properties.
   2. Comply with TIA/EIA-568-B.1 for performance specifications.
   3. Comply with TIA/EIA-568-B.2, Category 5e or higher (verify owner's standard).
   4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction

13.3 UTP CABLE HARDWARE

A. Manufacturers: Match existing owner's standard.

13.4 RS-232 CABLE

A. Standard Cable: NFPA 70, Type CM (or as indicated on the drawings).

   1. Paired, two pairs, No. 22 AWG, stranded (7x30) tinned-copper conductors.
   2. Polypropylene insulation.
   3. Individual aluminum foil-polyester tape shielded pairs with 100 percent shield coverage.

4. PVC jacket.
5. Pairs are cabled on common axis with No. 24 AWG, stranded (7x32) tinned-copper drain wire.
6. Flame Resistance: Comply with UL 1581.

13.5 RS-485 CABLE

A. Standard Cable: NFPA 70, Type CM (or as indicated on the drawings).

1. Paired, two pairs, twisted, No. 22 AWG, stranded (7x30) tinned-copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with UL 1581.

B. Plenum-Rated Cable: NFPA 70, Type CMP.

1. Paired, two pairs, No. 22 AWG, stranded (7x30) tinned-copper conductors.
2. Fluorinated ethylene propylene insulation.
3. Unshielded.
4. Fluorinated ethylene propylene jacket.
5. Flame Resistance: NFPA 262, Flame Test.

13.6 LOW-VOLTAGE CONTROL CABLE

A. Paired Cable: NFPA 70, Type CMG.

1. As specified by the manufacturer..
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with UL 1581.

B. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.

1. As specified by the manufacturer.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with NFPA 262.

13.7 CONTROL-CIRCUIT CONDUCTORS

A. Class 1 Control Circuits (where indicated): Stranded copper, Type THHN-THWN, in raceway, complying with UL 83.

B. Class 2 Control Circuits: Stranded copper, Type THHN-THWN, in raceway, power-limited cable, concealed in building finishes, complying with applicable UL standard.

C. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type THHN-THWN or Type TFFN in raceway, complying with UL 83.

13.8 IDENTIFICATION PRODUCTS

A. Comply with requirements in Division 26 Section "Identification for Electrical Systems."

13.9 SOURCE QUALITY CONTROL

A. Field test to manufacturer's specifications..

B. Cable will be considered defective if it does not pass tests and inspections.

PART 14 - EXECUTION

14.1 INSTALLATION OF PATHWAYS

A. Comply with TIA/EIA-569-A for pull-box sizing and length of conduit and number of bends between pull points.

B. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems" for installation of conduits and wireways.

C. Install manufactured conduit sweeps and long-radius elbows if possible.

14.2 INSTALLATION OF CONDUCTORS AND CABLES

A. Comply with NECA 1.

B. General Requirements for Cabling:

1. Comply with TIA/EIA-568-B.1.
2. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
3. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
4. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
5. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
6. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
7. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.

C. UTP Cable Installation:

1. Comply with TIA/EIA-568-B.2.
2. Install 110-style IDC termination hardware unless otherwise indicated.
3. Do not untwist UTP cables more than 1/2 inch (12 mm) from the point of termination to maintain cable geometry.

D. Installation of Control-Circuit Conductors:

1. Install wiring in raceways. Comply with requirements specified in Division 26 Section "Raceway and Boxes for Electrical Systems."

E. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend copper cable not in a wireway or pathway a minimum of 8 inches (200 mm) above ceilings by cable supports not more than 60 inches (1525 mm) apart.
3. Cable shall not be run in contact with pipes, ducts, or other potentially damaging items.

F. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA/EIA-569-A recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches (1200 mm).
3. Separation between Cables and Fluorescent Fixtures: A minimum of 5 inches (127 mm).

14.3 GROUNDING

A. For data communication wiring, comply with ANSI-J-STD-607-A and with BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

B. For low-voltage wiring and cabling, comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems."

14.4 IDENTIFICATION

A. Identify system components, wiring, and cabling according to TIA/EIA-606-A. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

14.5 FIELD QUALITY CONTROL

A. Perform manufacturer specified and industry standard tests and inspections.

B. UTP cabling: Document data for each measurement. Print data for submittals in a summary report that is formatted using Table 10.1 in BICSI TDMM as a guide, or transfer the data from the instrument to the computer, save as text files, print, and submit.

C. End-to-end cabling will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION 260523

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 15 - GENERAL

15.1 RELATED DOCUMENTS

A. Drawings and other Division 26 Specification Sections apply to this Section.

15.2 SUMMARY

A. This Section includes methods and materials for grounding systems and equipment.

15.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field quality-control test reports.

15.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 16 - PRODUCTS

16.1 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.

16.2 CONNECTORS

A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.

1. Pipe Connectors: Clamp type, sized for pipe.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

16.3 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad; 3/4 inch by10 feet (19 mm by 3 m) in diameter.

PART 17 - EXECUTION

17.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 12 AWG and smaller, and stranded conductors for No. 10 AWG and larger, unless otherwise indicated.

B. Underground Grounding Conductors: Install bare copper conductor, size as indicated on the drawings buried at least 24 inches (600 mm) below grade.

C. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors, except as otherwise indicated.

17.2 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.

B. Grounding Handholes with metallic elements: Install a driven ground rod through handhole floor, close to wall, and set rod depth so 4 inches (100 mm) will extend above finished floor. If necessary, install ground rod before manhole is placed Provide No. 6 AWG bare copper conductor from ground rod to all handhole metallic elements.

C. Install insulated equipment grounding conductors with all feeders and branch circuits.

17.3 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Rods: Drive rods (quantity per plans) until tops are 2 inches (50 mm) below finished floor or final grade, unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated on the drawings.
2. For grounding electrode system, install at least four rods spaced per plan and connect to the generator grounding electrode conductor terminal.

C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.
   1. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.
   2. Use exothermic-welded connectors for outdoor locations.

17.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections and prepare test reports:

   1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
   2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at generator enclosure grounding terminal and at individual ground rods. Make tests at ground rods before any conductors are connected.

      a. Measure ground resistance not less than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
      b. Perform tests by fall-of-potential method according to IEEE 81.

B. Report measured ground resistances that exceed the following values:

   1. Power and Lighting Equipment or System with Capacity 500 kVA and Less: 10 ohms.

C. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Engineer promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 18 - GENERAL

18.1 RELATED DOCUMENTS

A. Drawings also apply to this Section.

18.2 SUMMARY

A. This Section includes the following:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.

18.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. RMC: Rigid metal conduit.

18.4 PERFORMANCE REQUIREMENTS

A. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

18.5 QUALITY ASSURANCE

A. Comply with NFPA 70.

18.6 COORDINATION

A. See plans for design, size, and location of concrete bases.

PART 19 - PRODUCTS

19.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Allied Tube & Conduit.
    b. Cooper B-Line, Inc.; a division of Cooper Industries.
    c. ERICO International Corporation.
    d. GS Metals Corp.
    e. Thomas & Betts Corporation.
    f. Unistrut; Tyco International, Ltd.

2. Metallic Coatings (Exterior locations): Hot-dip galvanized after fabrication and applied according to MFMA-4.
3. Painted Coatings (Interior locations): Manufacturer's standard painted coating applied according to MFMA-4.
4. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices: Steel or malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated or stainless steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

    a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

        1) Cooper B-Line, Inc.; a division of Cooper Industries.
        2) Empire Tool and Manufacturing Co., Inc.
        3) Hilti Inc.
        4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
        5) MKT Fastening, LLC.

2. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
3. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
4. Toggle Bolts: All-steel springhead type.
5. Hanger Rods: Threaded steel.

PART 20 - EXECUTION

20.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized to meet specified design load limits.

D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

20.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present static loads within product loading limits.

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
2. To Existing Concrete: Expansion anchor fasteners.
3. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69 or Spring-tension clamps within specified limits.
4. To Light Steel: Sheet metal screws.
5. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

20.3 CONCRETE BASES

A. Construct concrete bases of dimensions indicated

B. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete unless otherwise indicated. Concrete materials, reinforcement, and placement requirements are specified on the drawings.

C. Anchor equipment to concrete base.

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

20.4 PAINTING

A. Touchup: Repair factory finishes marred by field welds, bolted connections, and abrasion.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

SECTION 260533 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 21 - GENERAL

21.1 RELATED DOCUMENTS

A. Drawings and other Division 26 Specification Sections, apply to this Section.

21.2 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

21.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. EPDM: Ethylene-propylene-diene terpolymer rubber.

C. FMC: Flexible metal conduit.

D. IMC: Intermediate metal conduit.

E. LFMC: Liquidtight flexible metal conduit.

F. RNC: Rigid nonmetallic conduit.

21.4 SUBMITTALS

A. Product Data: For surface fittings, handholes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For the following raceway components. Include plans, elevations, sections, details, and attachments to other work.

21.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 22 - PRODUCTS

22.1 METAL CONDUIT AND TUBING

A. Rigid Steel Conduit: ANSI C80.1.

B. IMC: ANSI C80.6.

C. EMT: ANSI C80.3.

D. FMC: Zinc-coated steel.

E. LFMC: Flexible steel conduit with PVC jacket.

F. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.
2. Fittings for EMT: Steel or die-cast, set-screw or compression type as acceptable to local AHJ.

22.2 NONMETALLIC CONDUIT

A. RNC: NEMA TC 2, Type EPC-40-PVC, unless otherwise indicated.

B. Fittings for ENT and RNC: NEMA TC 3; match to conduit or tubing type and material.

22.3 BOXES, ENCLOSURES, AND CABINETS

A. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

B. Cast-Metal Outlet and Device Boxes: NEMA FB 1, ferrous alloy or aluminum, Type FD, with gasketed cover.

C. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

D. Cast-Metal conduit bodies: NEMA FB 1, cast aluminum or galvanized, cast iron with gasketed cover.

E. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.

F. Cabinets:

1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.

22.4 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. Description: Comply with SCTE 77.

1. Color of Frame and Cover: Gray.
2. Configuration: Units shall be designed for flush burial and have open bottom, unless otherwise indicated.
3. Cover: Having structural load rating consistent with enclosure.
4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
5. Cover Legend: Molded lettering, as required for each service.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel or fiberglass or a combination of the two.

PART 23 - EXECUTION

23.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:

1. Exposed Conduit: Rigid steel conduit or IMC.
2. Concealed Conduit, Aboveground: Rigid steel conduit or IMC, EMT (where allowed by code) with listed fittings.
3. Underground Conduit: Rigid steel conduit or RNC, Type EPC-40-PVC, direct buried.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R or 4 as dictated by mounting location and position.
6. Application of Handholes and Boxes for Underground Wiring:
   a. Handholes and Pull Boxes Subject to Light-Duty Pedestrian Traffic Only: Fiberglass-reinforced polyester resin, structurally tested according to SCTE 77 with 3000-lbf (13 345-N) vertical loading.

B. Comply with the following indoor applications, unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
   a. Exposed and Subject to Severe Physical Damage: Rigid steel conduit or IMC.
2. Concealed in Ceilings and Interior Walls and Partitions: EMT.
3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
4. Damp or Wet Locations: Rigid steel conduit or IMC.
5. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, in damp or wet locations.

C. Minimum Raceway Size: 1/2-inch (16-mm) trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.

2. EMT: steel or die cast, set screw or compression listed for the application and acceptable to local AHJ.

23.2 INSTALLATION

A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.

B. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Support raceways as specified in Division 26 Section "Hangers and Supports for Electrical Systems."

E. Arrange stub-ups so curved portions of bends are not visible above the finished slab.

F. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.

G. Install raceway sealing fittings where conduits pass from exterior to interior locations and where otherwise required by NFPA 70.

H. Flexible Conduit Connections: Use maximum of 72 inches (1830 mm) of flexible conduit for equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

23.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Division 31 Section "Earth Moving" for pipe less than 6 inches (150 mm) in nominal diameter.
2. Install backfill as specified in Division 31 Section "Earth Moving."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Division 31 Section "Earth Moving."
4. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.

    a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete.
    b. For stub-ups at equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 120 inches from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.

5. Warning Tape: Provide approved warning per NEC.

23.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.

C. Install handholes and boxes flush with grade and with bottom below the frost line, below grade.

23.5 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

23.6 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 24 - GENERAL

24.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

24.2 SUMMARY

A. Section Includes:

1. Identification for raceways.
2. Identification of power and control cables.
3. Identification for conductors.
4. Underground-line warning tape.
5. Warning labels and signs.
6. Instruction signs.
7. Equipment identification labels.
8. Miscellaneous identification products.

24.3 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

24.4 QUALITY ASSURANCE

A. Comply with ANSI A13.1 and IEEE C2.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

24.5 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 25 - PRODUCTS

25.1 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

25.2 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

D. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

25.3 UNDERGROUND-LINE WARNING TAPE

A. Tape:

1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications lines.
2. Printing on tape shall be permanent and shall not be damaged by burial operations.
3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

B. Color and Printing:

1. Comply with ANSI Z535.1 through ANSI Z535.5.
2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE,.

3. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE.

25.4 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

C. Baked-Enamel Warning Signs:

1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch (6.4-mm) grommets in corners for mounting.
3. Nominal size, 7 by 10 inches (180 by 250 mm).

D. Metal-Backed, Butyrate Warning Signs:

1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch (1-mm) galvanized-steel backing; and with colors, legend, and size required for application.
2. 1/4-inch (6.4-mm) grommets in corners for mounting.
3. Nominal size, 10 by 14 inches (250 by 360 mm).

E. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."
3. Placarding as required by NFPA 70-701 and 702.

25.5 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch (1.6 mm) thick for signs up to 20 sq. inches (129 sq. cm) and 1/8 inch (3.2 mm) thick for larger sizes.

1. Engraved legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.
3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

B. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm).

C. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm). Overlay shall provide a weatherproof and UV-resistant seal for label.

25.6 EQUIPMENT IDENTIFICATION LABELS

A. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm).

B. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm). Overlay shall provide a weatherproof and UV-resistant seal for label.

C. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).

D. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).

E. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch (25 mm).

25.7 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self extinguishing, one piece, self locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 12,000 psi (82.7 MPa).
3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
4. Color: Black except where used for color-coding.

B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self extinguishing, one piece, self locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 12,000 psi (82.7 MPa).
3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
4. Color: Black.

25.8 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in Division 09 painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 26 - EXECUTION

26.1 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

F. System Identification Color-Coding Bands for Cables: Each color-coding band shall completely encircle cable. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.

G. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

H. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches (400 mm) overall.

26.2 IDENTIFICATION SCHEDULE

A. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:

1. Emergency Power.
2. Power.
3. UPS.
4. Control Wiring

B. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.

1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded all conductors.

a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, or as otherwise required by local codes and standards.

b. Colors for 208/120-V Circuits:

1) Phase A: Black.
2) Phase B: Red.
3) Phase C: Blue.

c. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

C. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source.

D. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.

E. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring.

F. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive vinyl warning labels or Baked-enamel metallic warning signs.

1. Comply with 29 CFR 1910.145.
2. Identify system voltage with black letters on an orange background.
3. Apply to exterior of door, cover, or other access.
4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:

a. Power transfer switches.
b. Controls with external control power connections.

G. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

H. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch- (10-mm-) high letters for emergency instructions at equipment used for power transfer.

I. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

    a. Indoor Equipment: Adhesive film label or Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.
    b. Outdoor Equipment: Engraved, laminated acrylic or melamine label or Stenciled legend 4 inches (100 mm) high.
    c. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

2. Equipment to Be Labeled:

    a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be engraved, laminated acrylic or melamine label.
    b. Enclosures and electrical cabinets.
    c. Emergency system boxes and enclosures.
    d. Control stations.
    e. Power transfer equipment.
    f. Contactors.
    g. Power-generating units.
    h. Monitoring and control equipment.

END OF SECTION 260553

SECTION 263213 - ENGINE GENERATORS

PART 27 - GENERAL

27.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

27.2 SUMMARY

A. This Section includes packaged engine-generator sets for emergency standby power supply with the following features:

1. Diesel engine.
2. Unit-mounted cooling system.
3. Unit-mounted and Remote control and monitoring.
4. Performance requirements for sensitive loads.
5. Load banks.
6. Outdoor enclosure.

B. Related Sections include the following:

1. Division 26 Section "Transfer Switches" for transfer switches including sensors and relays to initiate automatic-starting and -stopping signals for engine-generator sets.

27.3 DEFINITIONS

A. Operational Bandwidth: The total variation from the lowest to highest value of a parameter over the range of conditions indicated, expressed as a percentage of the nominal value of the parameter.

27.4 SUBMITTALS

A. Product Data: For each type of packaged engine generator indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. In addition, include the following:

1. Thermal damage curve for generator.
2. Time-current characteristic curves for generator protective device.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Dimensioned outline plan and elevation drawings of engine-generator set and other components specified.
2. Design Calculations: Signed and sealed by a qualified professional engineer. Calculate requirements for selecting vibration isolators.
3. Wiring Diagrams: Power, signal, and control wiring.

C. Qualification Data: For installer and manufacturer.

D. Source quality-control test reports.

1. Certified summary of prototype-unit test report.
2. Certified Test Reports: For components and accessories that are equivalent, but not identical, to those tested on prototype unit.
3. Report of factory test on units to be shipped for this Project, showing evidence of compliance with specified requirements.
4. Report of sound generation.
5. Report of exhaust emissions showing compliance with applicable regulations.
6. Certified Torsional Vibration Compatibility: Comply with NFPA 110.

E. Field quality-control test reports.

F. Operation and Maintenance Data: For packaged engine generators to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. List of tools and replacement items recommended to be stored at Project for ready access. Include part and drawing numbers, current unit prices, and source of supply.

G. Warranty: Special warranty specified in this Section.

27.5 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project, or operating under the direct supervision of such a representative for the purpose of the work.

1. Maintenance Proximity: Not more than four hours' normal travel time from Installer's place of business to Project site.

B. Manufacturer Qualifications: A qualified manufacturer. Maintain, within 100 miles (161 km) of Project site, a 24-hour service center capable of providing training, parts, and emergency maintenance repairs.

C. Source Limitations: Obtain packaged generator sets and auxiliary components through one source from a single supplier.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

E. Comply with ASME B15.1.

F. Comply with NFPA 37.

G. Comply with NFPA 70.

H. Comply with NFPA 99 as applicable to start-up time.

I. Comply with NFPA 110 requirements for Level 1 emergency power supply system.

J. Comply with UL 2200.

K. Engine Exhaust Emissions: Comply with applicable state and local government requirements.

L. Noise Emission: Provide 25dB reduction for 75dB average free-field for maximum noise level at 23 feet due to sound emitted by generator set including engine, engine exhaust, engine cooling-air intake and discharge, and other components of installation.

27.6 PROJECT CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:

1. Notify Owner no fewer than ten days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Owner's written permission.

B. Environmental Conditions: Engine-generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:

1. Operating Temperature: Minus 40 to plus 70 deg C.
2. Altitude: Sea level to 1000 feet (300 m).

C. Provide concrete base for package engine generator as indicated on the drawings. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified on the drawings.

27.7 WARRANTY

A. A five year comprehensive warranty for the generator set shall be included to guarantee against defective material and workmanship in accordance with the manufacturer's published warranty from date of start-up. Optional warranties shall be available upon request.

B. The generator set manufacturer and its distributor shall maintain a 24-hour parts and service organization. This organization shall be regularly engaged in a maintenance contract program to perform preventive maintenance and service on equipment similar to that specified. A service agreement a specified below shall be provided that includes system operation under simulated operating conditions, adjustment to the generator set, transfer switch, and controls as required, and certification in the owner's maintenance log of repairs made and proper functioning of equipment.

27.8 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, provide 24 months' full maintenance by skilled employees of manufacturer's designated service organization. Include quarterly exercising to check for proper starting, load transfer, and running under load. Include routine preventive maintenance as recommended by manufacturer and adjusting as required for proper operation. Provide parts and supplies same as those used in the manufacture and installation of original equipment.

27.9 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: One for every 10 of each type and rating, but no fewer than one of each.
2. Indicator Lamps: Two for every six of each type used, but no fewer than two of each.
3. Filters: One set each of lubricating oil, fuel, and combustion-air filters.

PART 28 - PRODUCTS

28.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings (Kohler 450REOZDD) or a comparable product by one of the following providing it meets the site space limitations (indicated on the drawings):

1. Caterpillar; Engine Div.
2. Onan/Cummins Power Generation; Industrial Business Group.
3. Generac.

28.2 ENGINE-GENERATOR SET

A. Factory-assembled and -tested, engine-generator set.

B. Mounting Frame: Maintain alignment of mounted components without depending on concrete foundation; and have lifting attachments.

1. Rigging Diagram: Inscribed on metal plate permanently attached to mounting frame to indicate location and lifting capacity of each lifting attachment and generator-set center of gravity.

C. Capacities and Characteristics:

1. Power Output Ratings: Nominal ratings as indicated.
2. Output Connections: Three-phase four wire.
3. Nameplates: For each major system component to identify manufacturer's name and address, and model and serial number of component.

D. Generator-Set Performance:

1. Steady-State Voltage Operational Bandwidth: 3 percent of rated output voltage from no load to full load.
2. Transient Voltage Performance: Not more than 20 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within three seconds.
3. Steady-State Frequency Operational Bandwidth: 0.25 percent of rated frequency from no load to full load.
4. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
5. Transient Frequency Performance: Less than 5 percent variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within five seconds.
6. Output Waveform: At no load, harmonic content measured line to line or line to neutral shall not exceed 5 percent total and 3 percent for single harmonics. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.
7. Sustained Short-Circuit Current: For a 3-phase, bolted short circuit at system output terminals, system shall supply a minimum of 250 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to generator system components.
8. Start Time: Comply with NFPA 110, Type 10, system requirements.

28.3 ENGINE

A. Fuel: Fuel oil, Grade DF-2.

B. Rated Engine Speed: 1800 rpm.

C. EPA certified.

D. Maximum Piston Speed for Four-Cycle Engines: 2250 fpm (11.4 m/s).

E. Lubrication System: The following items are mounted on engine or skid:

1. Filter and Strainer: Rated to remove 90 percent of particles 5 micrometers and smaller while passing full flow.
2. Thermostatic Control Valve: Control flow in system to maintain optimum oil temperature. Unit shall be capable of full flow and is designed to be fail-safe.
3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.

F. Engine Fuel System:

1. Main Fuel Pump: Mounted on engine. Pump ensures adequate primary fuel flow under starting and load conditions.
2. Relief-Bypass Valve: Automatically regulates pressure in fuel line and returns excess fuel to source.

G. Coolant Jacket Heater: Electric-immersion type, factory installed in coolant jacket system.

H. Governor: Adjustable electronic isochronous, with speed sensing.

I. Cooling System: Closed loop, liquid cooled, with radiator factory mounted on engine-generator-set mounting frame and integral engine-driven coolant pump.

1. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.
2. Size of Radiator: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.
3. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.
4. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, ultraviolet-, and abrasion-resistant fabric.

    a. Rating: 50-psig (345-kPa) maximum working pressure with coolant at 180 deg F (82 deg C), and noncollapsible under vacuum.
    b. End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.

J. Muffler/Silencer: Critical type, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements.

1. Minimum sound attenuation of 25 dB at 500 Hz.
2. Sound level measured at a distance of 10 feet (3 m) from exhaust discharge after installation is complete shall be 85 dBA or less.

K. Air-Intake Filter: Standard-duty, engine-mounted air cleaner with replaceable dry-filter element and "blocked filter" indicator.

L. Starting System: 24-V electric, with negative ground.

1. Components: Sized so they will not be damaged during a full engine-cranking cycle with ambient temperature at maximum specified in Part 1 "Project Conditions" Article.
2. Cranking Motor: Heavy-duty unit that automatically engages and releases from engine flywheel without binding.
3. Cranking Cycle: As required by NFPA 110 for system level specified.
4. Battery: Adequate capacity within ambient temperature range specified in Part 1 "Project Conditions" Article to provide specified cranking cycle at least twice without recharging.
5. Battery Cable: Size as recommended by engine manufacturer for cable length indicated. Include required interconnecting conductors and connection accessories.
6. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 35-A minimum continuous rating.
7. Battery Charger: Current-limiting, automatic-equalizing and float-charging type. Unit shall comply with UL 1236 and include the following features:

    a. Operation: Equalizing-charging rate of 10 A shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.
    b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 40 deg C to plus 60 deg C to prevent overcharging at high temperatures and undercharging at low temperatures.
    c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.
    d. Ammeter and Voltmeter: Flush mounted in door. Meters shall indicate charging rates.
    e. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.
    f. Enclosure and Mounting: NEMA 250, Type 1, wall-mounted cabinet.

28.4 FUEL OIL STORAGE

A. Comply with NFPA 30.

B. Double Wall Secondary Containment Base-Mounted Fuel Oil Tank: Factory installed and piped, with features include the following:

1. Listed under UL 142, subsection entitled Special Purpose Tanks EFVT category, and bearing their mark of UL Approval according to their particular classification.
2. Approved by the Illinois State Fire Marshal as a Non-Dispensing Aboveground Bulk Storage Tank.
3. The above ground steel secondary containment rectangular tank for use as a sub-base for diesel generators shall be manufactured and intended to be installed in accordance with NFPA 30 (Flammable and Combustible Liquids Code), NFPA 37 (Use of Stationary Combustible Engine and Gas Turbines), and NFPA 110 (Emergency and Standby Power Systems).

4. Tank level indicator.
5. Capacity: Fuel for 24 hours' continuous operation at 100 percent rated power output.
6. Vandal-resistant fill cap.
7. Minimum 3-gallon fill spill containment reservoir.
8. Construction, Primary Tank:
   a. Rectangular in shape constructed n clam shell fashion to ensure maximum structural integrity and allow the use of a full throat fillet weld.
   b. Reinforced steel box channel for generator support, with a load rating of 5000 lbs per mounting hole. Full height gussets at either end of the channel and at mounting holes.
   c. Exterior Finish: Exterior coating to be tested to withstand harsh environments including continuous salt spray and 100% humidity according to The American Standard Testing Methods Society.
9. Venting: Normal venting shall be sized in accordance with the American Petroleum Institute Standard No. 2000, Venting Atmospheric and Low Pressure Storage Tanks not less than 1-1/4" (3 cm) nominal inside diameter. A 1-1/4" atmospheric mushroom cap shall be furnished and shall be piped above the highest fill point as a minimum.
10. Emergency Venting: The emergency vent opening shall be sized to accommodate the toal capacity of both normal and emergency venting and shall be not less than that derived from NFPA 30, Table 2-8, and based on the wetted surface area of the tank. The wetted area of the tank shall be calculated on the basis of 100 percent of the primary tank. A zinc plated emergency pressure relief vent cap shall be furnished for the primary tank. The vent shall be spring-pressure operated, opening at 0.5/psig and full open pressure at 2.5 psig. Limits shall be stamp marked on the top of each vent.
11. Low Fuel Level Switch.

28.5 CONTROL AND MONITORING

A. Automatic Starting System Sequence of Operation: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of generator set. When mode-selector switch is switched to the on position, generator set starts. The off position of same switch initiates generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms. Operation of a remote emergency-stop switch also shuts down generator set.

B. Configuration: Operating and safety indications, protective devices, basic system controls, and engine gages shall be grouped in a common control and monitoring panel mounted on the generator set. Mounting method shall isolate the control panel from generator-set vibration.

C. Indicating and Protective Devices and Controls: As required by NFPA 110 for Level 1 system, NFPA-99, and NPFA-70, and listed under UL 508:

1. Hardware requirements:
   a. Run-off/reset-auto three-position selector switch.
   b. Alternator output voltage adjustment.
   c. Indicating lights (system ready-green; not in auto-yellow; programming mode-yellow; system warning-yellow; system shutdown-red).
   d. Lighted display with two lines of 20 alphanumeric characters for messages.
   e. Panel lights.
   f. Sixteen position sealed membrane keypad for menu selection and data entry.
   g. Faceplate operating guide.
   h. Audible Alarm.

2. Control Functions:
   a. Field programmable engine start dealy.
   b. Field programmable engine cooldown delay.
   c. Provisions for generator set to run at idle speed during warm-up and cooldown.
   d. Real time clock and calendar for time stamping events.
   e. Output for load shedding if generator reaches a user programmable percentage of its kW rating.
   f. Programmable cyclic cranking allowing up to six crank cycles and up to 45 seconds of crank time per cycle.
   g. Provision for sleep mode where no continuous battery charging is available.
   h. Alternator overload and short circuit protection.
   i. Integral voltage regulator.
   j. Software enabled excerciser.
3. Monitoring Requirements (viewable on the digital display):
   a. All output voltage (single phase, three phase, line to line, line to neutral at 0.25% accuracy).
   b. All single phase and three phase currents to 0.25% accuracy.
   c. Output frequency to 0.25% accuracy.
   d. Power factor by phase with leading/lagging indication.
   e. Total instantaneous kilowatt loading and klowatts per phase.
   f. kVars total and per phase.
   g. kVA total and per phase.
   h. kW hours.
   i. Percent generator set duty level (actual kW loading/kW rating).
4. Engine parameters monitored:
   a. Coolant temperature
   b. Oil pressure
   c. Battery Voltage
   d. RPM
   e. Lube oil temperature
   f. Lube oil level
   g. Crankcase pressure
   h. Coolant level
   i. Coolant pressure
   j. Fuel pressure
   k. Fuel rate
   l. Fuel used during last run
   m. Ambient temperature.
5. Operations records since system start-up stored on controller:
   a. Run time hours
   b. Run time loaded
   c. Run time unloaded
   d. Nmber of starts
   e. Factory test date
   f. Last run data including date, duration, loaded or unloaded.
   g. kW hours.
6. Operation records available in resettable form:
   a. Run time hours
   b. Run time loaded.
   c. Run time unloaded.
   d. kW hours
   e. Days of operation
   f. Number of starts
   g. Start date after reset.

7. Storage for the last 100 generator set system evetns with date and time event.
8. Stored on the controller and displayed on demand:
   a. Manufacturer's model and serial number
   b. Battery voltage
   c. kW rating
   d. Rated current
   e. System voltage
   f. System frequency
   g. Number of phases
9. Detect the following conditions, indicate if the condition will shut down the unit, and/or provide a warning and annunciate the condition on the alphanumeric display:
   a. Causing a system shut down:
      1) Air damper tripped (if used)
      2) Customer programmed digital aux input ON.
      3) Customer programmed analog aux input out of bounds.
      4) Emergency stop
      5) High coolant temperature
      6) High oil temperature.
      7) Controller nternal fault
      8) Locked Rotor
      9) Low coolant level
      10) Low oil pressure
      11) Master switch error
      12) NFPA common alarm
      13) Overcrank
      14) Overspeed with user adjustable level
      15) Overvoltage with user adjustable level
      16) Overfrequency with user adjustable level
      17) Underfrequency with user adjustable level
      18) Undervoltage with user adjustable level
      19) Coolant temperature signal loss
      20) Oil pressure gauge signal loss
   b. Causing a warning but leaving the generator running:
      1) Battery charger failure
      2) Customer programmed digital aux input ON
      3) Customer programmed analo input ON
      4) Power system supply load
      5) High battery voltage
      6) High coolant temperature
      7) Load shed
      8) Loss of AC sensing
      9) Underfrequency
      10) Low battery voltage with user adjustable level
      11) Low coolant temperature
      12) Low fuel level or pressure
      13) Low Oil pressure
      14) NFPA common alarms
      15) Overcurrent
      16) Speed sensor fault
      17) Weak battery
      18) Alternator protection activated.
10. Inputs and Outputs:
   a. Twenty-one dry contact inputs user configurable for shutdown or alarm.

b. Seven analog inputs user programmable for monitoring and control, each accepting 0-5 volt analog signals.
c. Resolution 1 part in 10,000.
d. Each input programmable to provide up to 4 trip values (2 warnings, 2 shutdowns).
e. Analog values viewable on the display.
f. User configured inputs definable using words or phrases viewable on the display.
g. External ground fault detector input
h. Reset of system faults.
i. Remote 2-wire start.
j. Remote emergency stop.
k. Idle mode enable.

11. Outputs:
    a. All NFPA Level 1 outputs.
    b. Thirty available outputs available for interface to other equipment.
        1) User configurable from a list of at least 25 functions and faults.
        2) Shall drive optional dry contacts.
    c. Programmable user define common fault with minimum 40 selections.
12. System Programming:
    a. Must be possible to disable programming so the system can only be monitored.
    b. It shall be possible to program the control with the controller keypad, a local personal computer, or a network resident computer.
    c. Programming access must be password protected.
    d. Programmable functions:
        1) Time Delay settings:
            a) Generator run time (0-72 hours) – exercise.
            b) Load shed
            c) Engine start
            d) Engine cooldown
            e) Overvoltage and udnervoltage
            f) Starting aid
            g) Crank on and crank pause time
            h) Idle time
        2) Trip point settings:
            a) High battery voltage
            b) Low battery voltage
            c) Overspeed
            d) Underfrequency
            e) Overfrequency
            f) Overvoltage
            g) Undervoltage
            h) Load shed
13. Communications:
    a. Controller must communicate to the engine control module for control, monitoring, and diagnostics.
    b. Industry standard Modbus communication shall be provided.
    c. The controller shall communicate to a personal computer running a Windows platform
    d. Shall be provided with a variety of output connections including RS-232 connection and RS-485.
    e. Provide a Modbus/Ethernet converter at the annunciator panel for connection to the owner's LAN.
    f. A single software package (equal to Kohler Monitor III) with the following capabilities is required:

1) Shall monitor any combination of transfer switches and generator set controls.
2) Up to 128 devices at a single site must be supported.
3) The same software package must support communications over a variety of formats.
4) Access to individual devices by the software shall be protected by a password. USB port riser keys shall enable access to the generator software from the network. Provide five keys.
5) It must be possible to add devices (ATS and generator set controllers) up to 128 and up to 128 sites without changing the software package.
6) A single software screen must be capable of displaying data from multiple devices simultaneously.
7) It shall be possible to reset shutdown faults and restart the generator using the software.

D. Supporting Items: Include sensors, transducers, terminals, relays, and other devices and include wiring required to support specified items. Locate sensors and other supporting items on engine or generator, unless otherwise indicated.

E. Connection to Data Link: A separate terminal block, factory wired to Form C dry contacts, for each alarm and status indication is reserved for connections for data-link transmission of indications to remote data terminals. Data system connections to terminals are covered in Division 26 Section "Electrical Power Monitoring and Control."

F. Common Remote Audible Alarm: Comply with NFPA 110 requirements for Level 1 systems. Include necessary contacts and terminals in control and monitoring panel.

1. Overcrank shutdown.
2. Coolant low-temperature alarm.
3. High coolant temperature warning.
4. High coolant temperature shutdown.
5. Low oil pressure shutdown.
6. Low oil pressure warning.
7. Overspeed
8. Low coolant level.
9. EPS supplying load.
10. Control switch not in auto position.
11. Battery-charger malfunction alarm.
12. Battery low-voltage alarm.
13. Air damper indicator.
14. Lamp test
15. Remote emergency stop.

G. Remote Alarm Annunciator: Comply with NFPA 99. An LED labeled with proper alarm conditions shall identify each alarm event and a common audible signal shall sound for each alarm condition. Silencing switch in face of panel shall silence signal without altering visual indication. Connect so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset. Cabinet and faceplate are surface- or flush-mounting type to suit mounting conditions indicated.
1. Monitors the condition of a generator set equipped with the specified controller.
2. Meets NFPA 110 standard for critical facilities.
3. Surface enclosure.
4. Uses Modbus RTU open communication protocol
5. Provide with Modbus/Ethernet converter for network connection.

H. Remote Emergency-Stop Switch: Surface wall mounted, unless otherwise indicated; and labeled. Push button shall be protected from accidental operation.

28.6 GENERATOR OVERCURRENT AND FAULT PROTECTION

A. Generator Circuit Breaker(s): Molded-case, thermal-magnetic type; 80 percent rated; complying with NEMA AB 1 and UL 489.

1. Tripping Characteristics: Designed specifically for generator protection.
2. Trip Rating(s): As indicated on the plan.

28.7 GENERATOR, EXCITER, AND VOLTAGE REGULATOR

A. Comply with NEMA MG 1.

B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.

C. Electrical Insulation: Class H or Class F.

D. Stator-Winding Leads: Brought out to terminal box to permit future reconnection for other voltages if required.

E. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity.

F. Enclosure: Dripproof.

G. Instrument Transformers: Mounted within generator enclosure.

H. Voltage Regulator: Solid-state type, separate from exciter, providing performance as specified.

1. Provide individual adjustments for voltage range, stability, and volts-per-hertz operations.

I. Windings: The alternator shall be salient pole, brushless, 12-lead reconnectable, self-ventilated of drip-proof construction with amortisseur rotor windings and skewed stator for smooth voltage waveform.

J. The generator set shall meet the transient performance requirements of ISO 8528-5, level G-3.

28.8 LOAD BANK

A. Description: Provide lugs for connection of portable load bank test equipment.

28.9 OUTDOOR GENERATOR-SET ENCLOSURE

A. Description: Vandal-resistant, weatherproof steel housing, wind resistant up to 100 mph (160 km/h). Multiple panels shall be lockable and provide adequate access to components requiring maintenance. Panels shall be removable by one person without tools. Instruments and control shall be mounted within enclosure.

B. Description: Prefabricated or preengineered enclosure with the following features:
   1. Structural Design and Anchorage: Comply with ASCE 7 for wind loads.
   2. Louvers: Equipped with bird screen and filter arranged to permit air circulation when engine is not running while excluding exterior dust, birds, and rodents.
   3. Locking Hinged Doors.
   4. Muffler Location: Within enclosure.

C. Engine Cooling Airflow through Enclosure: Maintain temperature rise of system components within required limits when unit operates at 110 percent of rated load for 2 hours with ambient temperature at top of range specified in system service conditions.

   1. Louvers: Fixed-engine, cooling-air inlet and discharge. Storm-proof and drainable louvers prevent entry of rain and snow.
   2. Automatic Dampers: At engine cooling-air inlet and discharge. Dampers shall be closed to reduce enclosure heat loss in cold weather when unit is not operating.

D. Factory installed distribution panel, serving factory wired lighting, receptacles, block heater, and battery charger. Arrange for external electrical connection per the drawings.
   1. Interior Lights with Switch: Factory-wired, vaporproof-type fixtures within housing; arranged to illuminate controls and accessible interior.
      a. AC lighting system and connection point for operation when remote source is available.
   2. Convenience Outlets: Factory wired, GFCI.

28.10 VIBRATION ISOLATION DEVICES

A. Elastomeric Isolator Pads: Oil- and water-resistant elastomer or natural rubber, arranged in single or multiple layers, molded with a nonslip pattern and galvanized-steel baseplates of sufficient stiffness for uniform loading over pad area, and factory cut to sizes that match requirements of supported equipment.

   1. Material: Standard neoprene.
   2. Durometer Rating: As recommended by the manufacturer for the application as coordinated with the foundation design.
   3. Number of Layers: As recommended by the manufacturer for the application as coordinated with the foundation design.

28.11 FINISHES

A. Indoor and Outdoor Enclosures and Components: Manufacturer's standard finish over corrosion-resistant pretreatment and compatible primer.

28.12 SOURCE QUALITY CONTROL

A. Prototype Testing: Factory test engine-generator set using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.

   1. Tests: Comply with NFPA 110, Level 1 Energy Converters and with IEEE 115.

B. Production Tests: Each generator set shall be tested under varying loads with guards and exhaust system in place. Tests shall include:
   1. Maximum power.
   2. Voltage regulation.
   3. Transient and steady-state governing.
   4. Single-step load pickup and full load run.
   5. Safety shutdown.

28.13 EXAMINATION

A. Examine areas, equipment bases, and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting packaged engine-generator performance.

B. Examine roughing-in of electrical connections. Verify actual locations of connections before packaged engine-generator installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

28.14 INSTALLATION

A. Comply with packaged engine-generator manufacturers' written installation and alignment instructions and with NFPA 110.

B. Install packaged engine generator to provide access, without removing connections or accessories, for periodic maintenance.

C. Install packaged engine generator with elastomeric isolator pads on concrete foundation as prescribed by the drawings

D. Install all factory supplied equipment shipped loose for field installation and/or not otherwise specified as factory wired or installed..

28.15 CONNECTIONS

A. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems," and as indicated on the drawings.

B. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

28.16 IDENTIFICATION

A. Identify system components according to Division 26 Section "Identification for Electrical Systems."

28.17 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.

B. Perform tests and inspections and prepare test reports.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections:

1. Perform tests recommended by manufacturer and each electrical test and visual and mechanical inspection for "AC Generators and for Emergency Systems" specified in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. NFPA 110 Acceptance Tests: Perform tests required by NFPA 110 that are additional to those specified here including, but not limited to, single-step full-load pickup test.
3. Battery Tests: Equalize charging of battery cells according to manufacturer's written instructions. Record individual cell voltages.
    a. Measure charging voltage and voltages between available battery terminals for full-charging and float-charging conditions. Check electrolyte level and specific gravity under both conditions.
    b. Test for contact integrity of all connectors. Perform an integrity load test and a capacity load test for the battery.
    c. Verify acceptance of charge for each element of the battery after discharge.
    d. Verify that measurements are within manufacturer's specifications.
4. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float-charging conditions.
5. System Integrity Tests: Methodically verify proper installation, connection, and integrity of each element of engine-generator system before and during system operation. Check for air, exhaust, and fluid leaks.
6. Voltage and Frequency Transient Stability Tests: Confirm voltage and frequency transients match production tests.
7. Harmonic-Content Tests: Verify that harmonic content is within specified limits.
8. Noise Level Tests: Measure A-weighted level of noise emanating from generator-set installation, including engine exhaust and cooling-air intake and discharge, at four locations on the property and compare measured levels with required values.

D. Coordinate tests with tests for transfer switches and run them concurrently.

E. Test instruments shall have been calibrated within the last 12 months, traceable to standards of NIST, and adequate for making positive observation of test results. Make calibration records available for examination on request.

F. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

G. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation at each building.

H. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

I. Remove and replace malfunctioning units and retest or reinspect as applicable as specified above.

J. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.

K. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. Attach a label or tag to each tested component indicating satisfactory completion of tests.

28.18 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged engine generators. Assume a minimum of one four-hour training session for each of two shifts (total of eight hours) for generator and transfer switch maintenance, and one six hour session for software training.

END OF SECTION 263213

SECTION 263600 - TRANSFER SWITCHES

PART 29 - GENERAL

29.1 RELATED DOCUMENTS

A. Drawings also apply to this Section.

29.2 SUMMARY

A. This Section includes transfer switches rated 600 V and less, including the following:

1. Automatic transfer switches.
2. Remote monitoring..

B. Related Sections include the following:
1. Division 26 Section "Engine Generators".

29.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, weights, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: Dimensioned plans, elevations, sections, and details showing physical dimensions, minimum clearances, conductor entry provisions, gutter space, installed features and devices, and material lists for each switch specified.

C. Qualification Data: For manufacturer.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Features and operating sequences, both automatic and manual.
2. List of all factory settings of relays; provide relay-setting and calibration instructions, including software, where applicable.

29.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Maintain a service center capable of providing training, parts, and emergency maintenance repairs within a response period of less than eight hours from time of notification.

B. Source Limitations: Obtain automatic transfer switches through same vendor supplying the generator.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Comply with NEMA ICS 10 "AC Automatic Transfer Switches."

E. Comply with NFPA 70.

F. Comply with NFPA 99.

G. Comply with NFPA 110.

H. Comply with UL 1008 unless requirements of these Specifications are stricter.

I. IEEE Standard 446 "IEEE Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications."

J. NEC Article 701 (Building 'C'), 702 (Building 'E.').

29.5 WARRANTY: Manufacturer's standard 5-year extended parts & labor.

29.6 PROJECT CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service:

1. Notify Owner no fewer than ten days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Owner's written permission.

29.7 COORDINATION

A. Coordinate final size and location of wall anchors. Meet manufacturer's recommendations.

PART 30 - PRODUCTS

30.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide as follows:

1. Building 'C' shall be as stipulated on the plan (Asco 300 series), no substitution allowed (due to space limitations).

2. Building 'E': service entrance rated Contactor Transfer Switch as indicated on the drawings (Asco 300SE series) or a competitive equal from generator vendor.

30.2 GENERAL TRANSFER-SWITCH PRODUCT REQUIREMENTS

A. Indicated Current Ratings: as indicated on the drawings.

B. Tested Fault-Current Closing and Withstand Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the fault conditions indicated, based on testing according to UL 1008.

1. Verify available fault current with the serving utility and advise engineer immediately of any conflicts with manufacturer's rating.

C. Solid-State Controls: Repetitive accuracy of all settings shall be plus or minus 2 percent or better over an operating temperature range of minus 20 to plus 70 deg C.

D. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.41. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.

E. Electrical Operation: Accomplish by a nonfused, momentarily energized solenoid mechanism, mechanically and electrically interlocked in both directions to assure only one of two possible positions, normal or emergency.

F. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.

1. Limitation: Switches using molded-case switches or circuit breakers or insulated-case circuit-breaker components are not acceptable.
2. Switch Action: Double throw; mechanically held in both directions.
3. Contacts: Silver composition main contacts, segmented, blow-on construction, and separate arcing contacts.
4. Inspection of all contacts shall be possible from the front of the switch without disassembly of operating linkages and without disconnection of power conductors. A manual operating handle shall be provided for maintenance purposes. The handle shall permit the operator to manually stop the contacts at any point throughout their entire travel to inspect and service the contacts when required.

G. Neutral Switching. Provide neutral pole switched simultaneously with phase poles.

H. Heater: Equip switches exposed to outdoor temperatures and humidity (Building 'E') with an internal heater. Provide thermostat within enclosure to control heater.

I. Additional contacts for monitoring and paging (by others).

J. Annunciation, Control, and Programming Interface Components: Devices at transfer switches for communicating with remote monitoring devices, annunciators, or annunciator and control panels shall have communication capability matched with remote device.

K. Factory Wiring: Train and bundle factory wiring and label, consistent with Shop Drawings, either by color-code or by numbered or lettered wire and cable tape markers at terminations. Color-coding and wire and cable tape markers are specified in Division 26 Section "Identification for Electrical Systems."

1. Designated Terminals: Pressure type, suitable for types and sizes of field wiring indicated.
2. Power-Terminal Arrangement and Field-Wiring Space: Suitable for top, side, or bottom entrance of feeder conductors as indicated.
3. Control Wiring: Equipped with lugs suitable for connection to terminal strips.

L. Enclosures: General-purpose NEMA 250, Type 1 (Building 'C') or 3R (Building 'E') complying with NEMA ICS 6 and UL 508, unless otherwise indicated.

30.3 AUTOMATIC TRANSFER SWITCHES

A. Comply with Level 1 equipment according to NFPA 110.

B. Switching Arrangement: Double-throw type, incapable of pauses or intermediate position stops during normal functioning, unless otherwise indicated.

C. A push-button type test switch shall be provided to simulate a normal source failure.

D. A push-button type switch to bypass the time delay on transfer to emergency, the engine exerciser period on the retransfer ro normal time delay whichever delay is active at the time the push-button is activated.

E. Signal-Before-Transfer Contacts: A set of normally open/normally closed dry contacts operates in advance of retransfer to normal source. Interval is adjustable from 1 to 30 seconds.

F. Digital Communication Interface: Ethernet output for monitoring of system condition via network resident workstations and manufacturer's monitoring software.

G. In-Phase Monitor: Factory-wired, internal relay controls transfer so it occurs only when the two sources are synchronized in phase. Relay compares phase relationship and frequency difference between normal and emergency sources and initiates transfer when both sources are within 15 electrical degrees, and only if transfer can be completed within 60 electrical degrees. Transfer is initiated only if both sources are within 2 Hz of nominal frequency and 70 percent or more of nominal voltage.

H. Motor Disconnect and Timing Relay: Controls designate starters so they disconnect motors before transfer and reconnect them selectively at an adjustable time interval after transfer. Control connection to motor starters is through wiring external to automatic transfer switch. Time delay for reconnecting individual motor loads is adjustable between 1 and 60 seconds, and settings are as indicated. Relay contacts handling motor-control circuit inrush and seal currents are rated for actual currents to be encountered.

I. Automatic Transfer-Switch Features:

1. Undervoltage Sensing for Each Phase of Normal Source: Sense low phase-to-ground voltage on each phase. Pickup voltage shall be adjustable 95 percent of nominal, and dropout voltage is adjustable from 70 to 90 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.
2. Adjustable Time Delay: For override of normal-source voltage sensing to delay transfer and engine start signals. Adjustable from zero to six seconds, and factory set for one second.
3. Voltage/Frequency Lockout Relay: Prevent premature transfer to generator. Pickup voltage shall be adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency shall be adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.
4. Time Delay for Retransfer to Normal Source: Adjustable from 0 to 30 minutes, and factory set for 10 minutes to automatically defeat delay on loss of voltage or sustained undervoltage of emergency source, provided normal supply has been restored.
5. Test Switch: Simulate normal-source failure.
6. Switch-Position Pilot Lights: Indicate source to which load is connected.
7. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and emergency-source sensing circuits.

a. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
b. Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available."

8. Unassigned Auxiliary Contacts: Two normally open, single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.
9. Transfer Override Switch: Overrides automatic retransfer control so automatic transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.
10. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 10 A at 32-V dc minimum.
11. Engine Shutdown Contacts: Time delay adjustable from zero to five minutes, and factory set for five minutes. Contacts shall initiate shutdown at remote engine-generator controls after retransfer of load to normal source.
12. Engine-Generator Exerciser (Building 'E' unit only): Solid-state, programmable-time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods are adjustable from 10 to 30 minutes. Factory settings are for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include the following:

    a. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
    b. Push-button programming control with digital display of settings.
    c. Integral battery operation of time switch when normal control power is not available.
    d. Coordinate with owner for selection of exercise day and time.

30.4 NETWORK MONITORING.

A. Functional Description: A microprocessor controller shall direct the operation of the transfer switch.

B. Communications Interface: Provide a connectivity module to allow several different serial devices to communicate at different baud rates and with different protocols to a common Ethernet media. The module shall be used to connect the controller to a standard Ethernet TCP/IP network with standard RJ-45 connector. The module shall contain built-in program applications for each monitored device that can load automatically to a standard web browser.

1. Monitors and power transfer switch.
2. Monitors normal and emergency voltages and frequency.
3. Indicates transfer switch position and source availability.
4. View normal and emergency voltage and frequency settings.
5. View transfer switch time-delay settings.

30.5 SOURCE QUALITY CONTROL

A. Factory test and inspect components, assembled switches, and associated equipment. Ensure proper operation. Check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements. Perform dielectric strength test complying with NEMA ICS 1.

PART 31 - EXECUTION

31.1 INSTALLATION

A. Identify components according to Division 26 Section "Identification for Electrical Systems."

B. Set field-adjustable intervals and delays, relays, and engine exerciser clock to Owner defined settings. Meet with owner prior to installation to ascertain preferences.

31.2 CONNECTIONS

A. Wiring to Remote Components: Match type and number of cables and conductors to control and communication requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to Owner if necessary to accommodate required wiring.

B. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

C. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

31.3 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports:

1. Engage a factory-authorized service representative to inspect components, assemblies, and equipment installation, including connections, and to assist in testing.
2. After installing equipment and after electrical circuitry has been energized, test for compliance with requirements.
3. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
4. Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.

    a. Check for electrical continuity of circuits and for short circuits.
    b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
    c. Verify that manual transfer warnings are properly placed.
    d. Perform manual transfer operation.

5. After energizing circuits, demonstrate interlocking sequence and operational function for each switch at least three times.

    a. Simulate power failures of normal source to automatic transfer switches and of emergency source with normal source available.
    b. Verify time-delay settings.
    c. Verify pickup and dropout voltages by data readout or inspection of control settings.
    d. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.

B. Coordinate tests with tests of generator and run them concurrently.

C. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.

D. Remove and replace malfunctioning units and retest as specified above.

31.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain transfer switches and related equipment as specified below. Refer to Division 26, Section "Engine Generators."

END OF SECTION 263600

ALL QUESTIONS PERTAINING TO THIS BID MUST BE SUBMITTED IN WRITING TO THE PURCHASING DEPARTMENT NO LATER THAN 4:00 PM. MONDAY, DECEMBER 29, 2008. FAXED AND EMAILED ACCEPTED.

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